
Inflow to Estuary: Yuna Watershed - Samana Bay, DR
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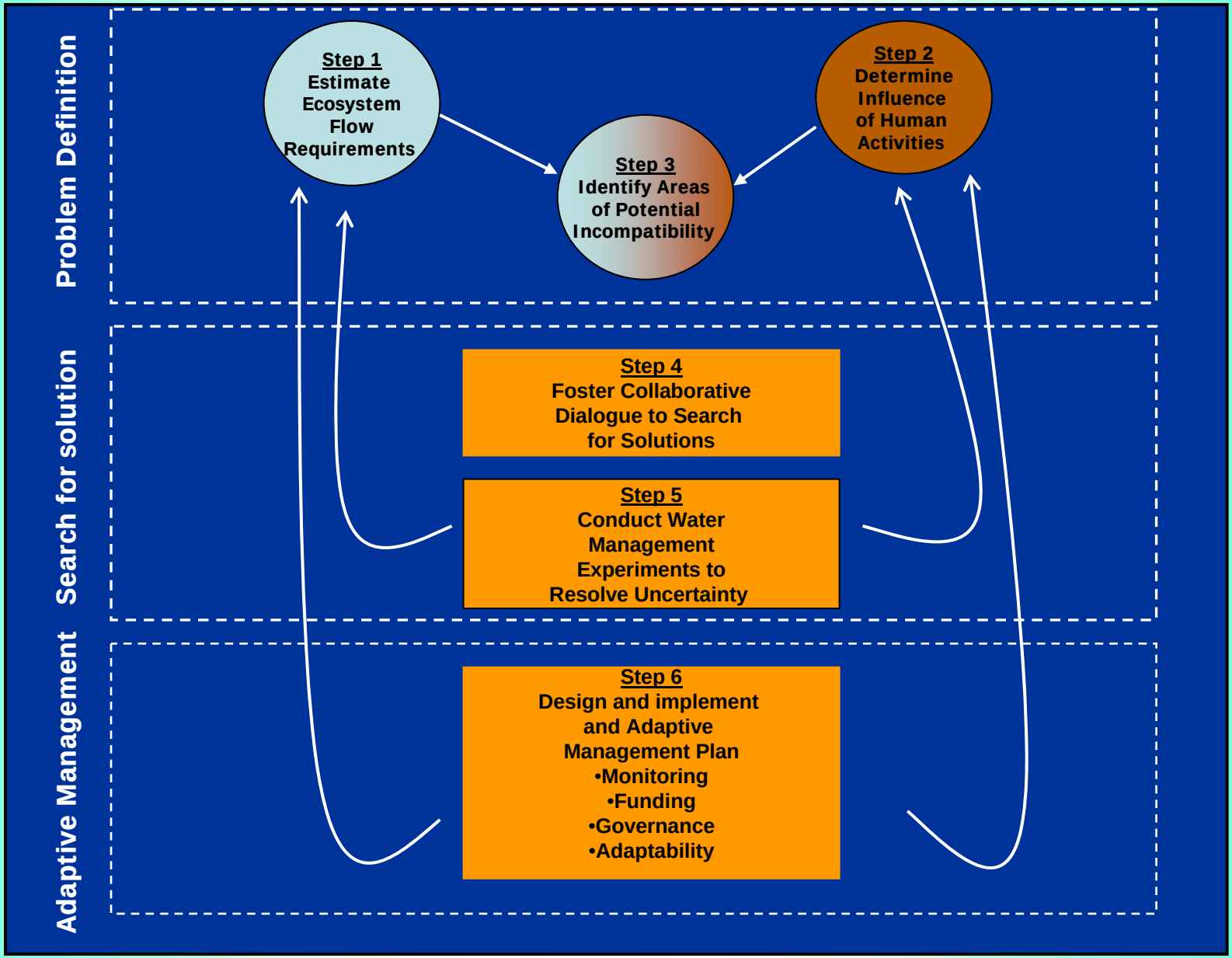
Project Objectives

- Refine methods for assessing the ecological and social impacts of changes in the quantity, quality and pulsing of freshwater flows in rivers and estuaries.
- Integrate the analysis of impacts on freshwater flows and associated ecosystem degradation into the ongoing goal setting, planning and decision-making processes.
- Design an action strategy and monitoring scheme that can be used to shape and inform future management decisions affecting the uses and allocation of freshwater as these affect the rivers and estuaries.
- Document lessons learned and prepare a revised methods guide for assessing changes to freshwater inflows to estuaries and integrating that information into coastal management processes.

Project Assumptions

- Water managers and regulators face a difficult challenge in balancing a variety of stakeholder interests in a world in which resource demands continue to intensify.
- To help facilitate integrated water resources management, The Nature Conservancy developed a new decision-making framework for ecologically sustainable water management (ESWM).
- ESWM can help water managers organize, analyze, and build the information and knowledge required to identify incompatibilities among various human and ecosystem needs for water and provides a structure for resolving those incompatibilities through collaboration and experimentation.
- ESWM framework is built on the understanding that societal values for a river are optimized when water is store, diverted, and release in a manner that meets human needs for energy production, water supply, and other municipal and industrial needs while maintaining adequate flows to sustain a healthy ecosystem.

A framework for ecologically sustainable water management



Source: Richter et al. 2005. A Framework for Ecologically Sustainable Water Management. Hydro Review, July 2005.

Project Components

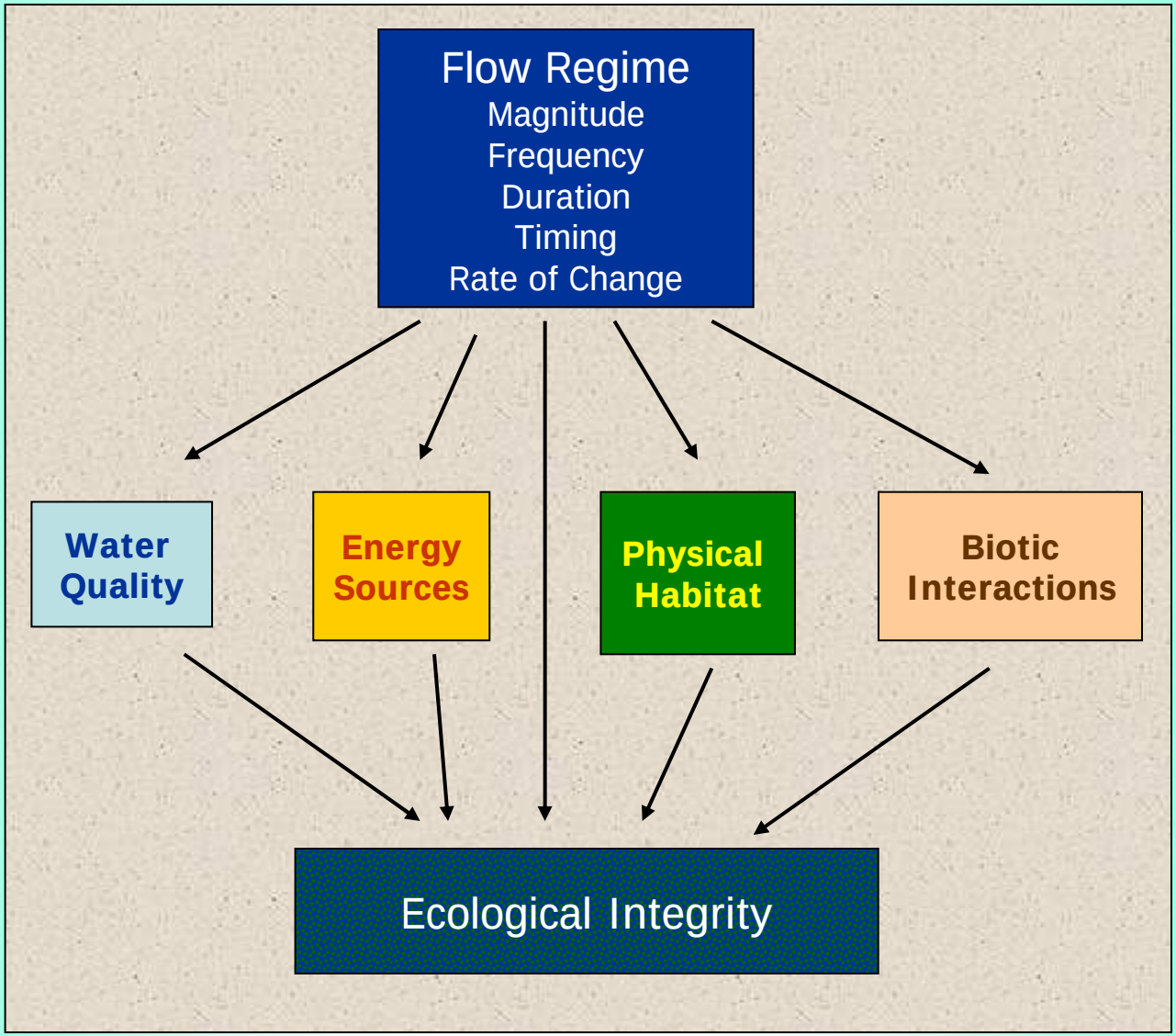
1. Overview of the Watershed
    a) Boundaries of the Yuna Watershed and Tributaries
    b) Gauging Stations and River Flow Patterns
2. Overview of the Estuary of Samana Bay
    a) Physical and Ecological Features,
    b) Freshwater Flow and the Ecology of the Samana Estuary
3. Water Dependent Sectors and Resource Use in the Watershed
    a) Agriculture
    b) Mining
    c) Tourism in Samaná Bay
    d) Fisheries
4. The System of Dams, Reservoirs, Irrigation, and Hydropower
5. Threats to the Quantity, Timing and Quality of Freshwater Inflows and Estuary Health
    a) Conceptual Model Overview
    b) Water Contamination from Rice Cultivation and Other Sources
    c) Assessment of the Impact of Dams on the Yuna River Flow Regime
    d) Proposed Construction of New Dams
    e) Deforestation and Sedimentation
    f) Overfishing
    g) Aquaculture
    h) Other Threats
6. Governance
    a) Watershed Governance,
    b) Coastal and Marine Governance of Samana Bay / Yuna Estuary.

Ecological River Integrity

- The ecological integrity of river ecosystems depends on their natural dynamic character.
- Flow regime is of central importance in sustaining the ecological integrity of flowing water systems.
- The five components of the flow regime – magnitude, frequency, duration, timing, and rate of change – influence integrity both directly and indirectly, through their effects on other primary regulators of integrity.
- Modification of flow thus has cascading effects on the ecological integrity of rivers.

Source: Karr, JR. 1991. Biological integrity: a long neglected aspect of water resource management. Ecological Applications 1: 66-84.

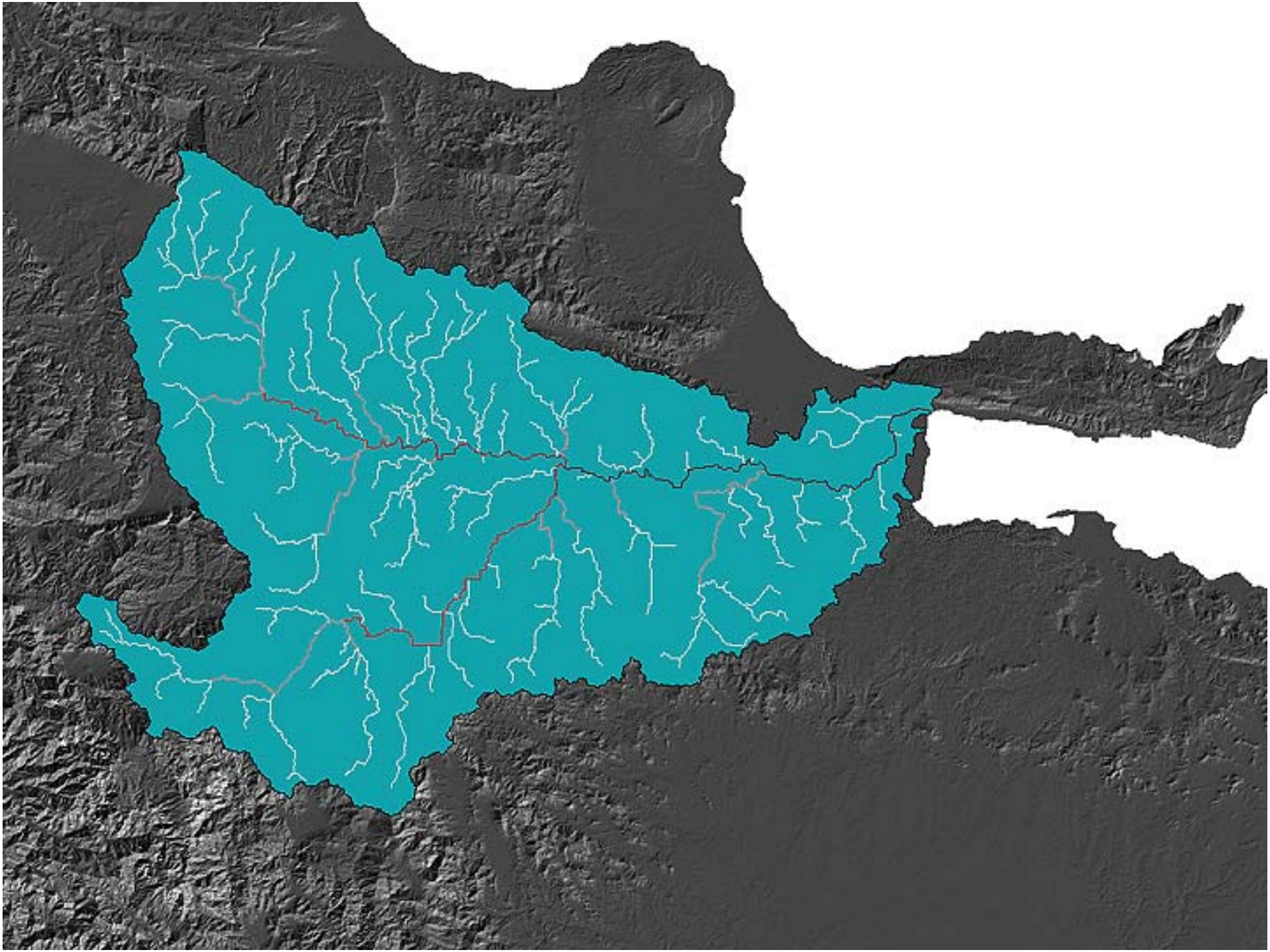
The Ecological Integrity of River Ecosystems depends on their Natural Dynamic Character



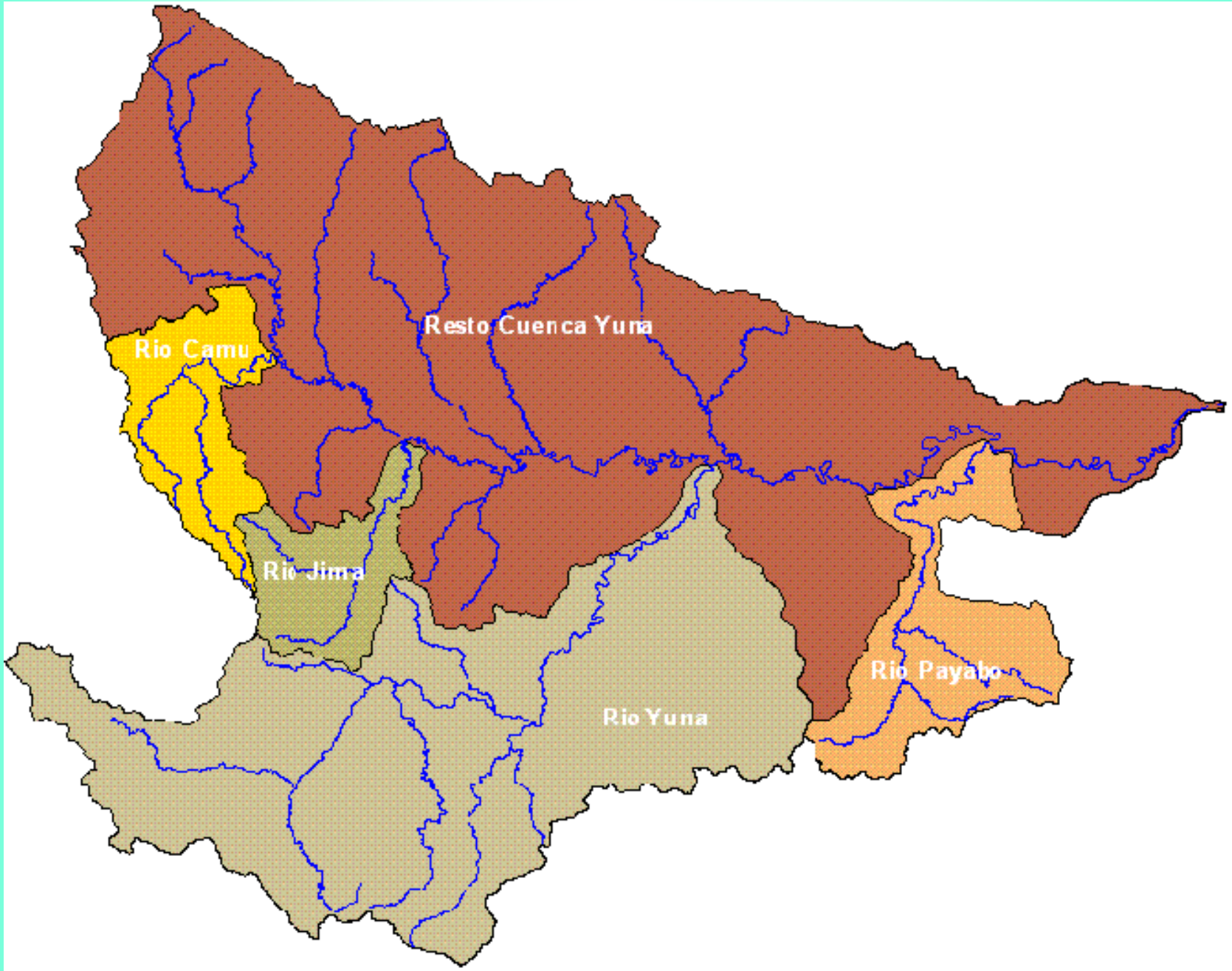
Source: Karr, JR. 1991. Biological integrity: a long-neglected aspect of water resource management. Ecological Applications 1:66-84

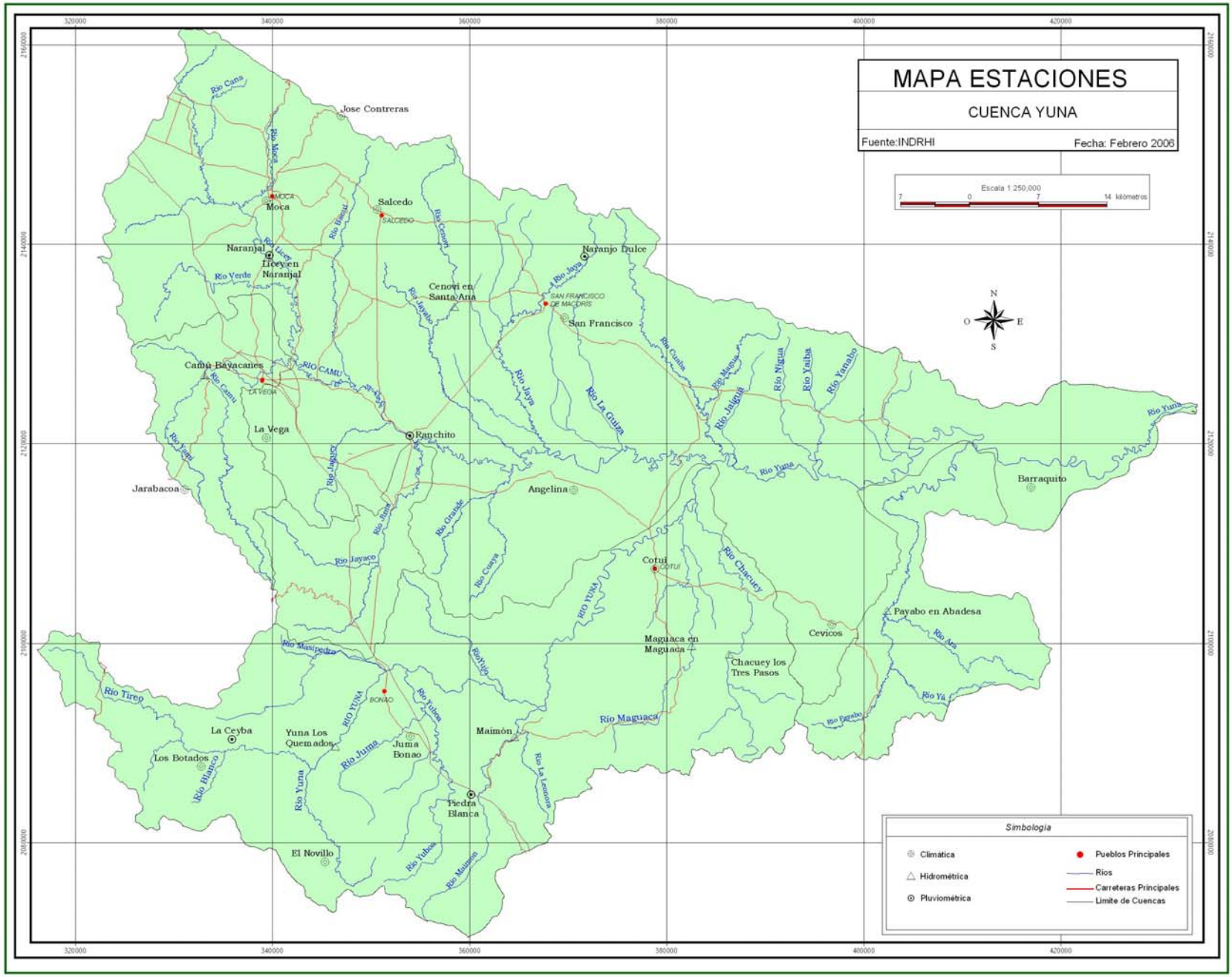
Relevance of Flow Requirements

- Rivers have complex ecosystem dynamics that involve multivariate habitat influences, complex and varied life histories of riverine species, biotic interactions, geomorphic change and other potentially critical factors.
- Native riverine species possess life history traits that enable individuals to survive and reproduce within a certain range of environmental variation.
- A myriad of environmental factors / attributes are known to shape the habitat templates that control aquatic and riparian species distributions.
- Hydrological variation plays a major part in structuring the biotic diversity within river ecosystems as it controls key habitat conditions within the river channel, floodplain and estuary.



Yuna Watershed




MAPA ESTACIONES
CUENCA YUNA
Fuente:INDRHI
Fecha: Febrero 2006
Escala 1:250,000
7 0 7 14 kilómetros
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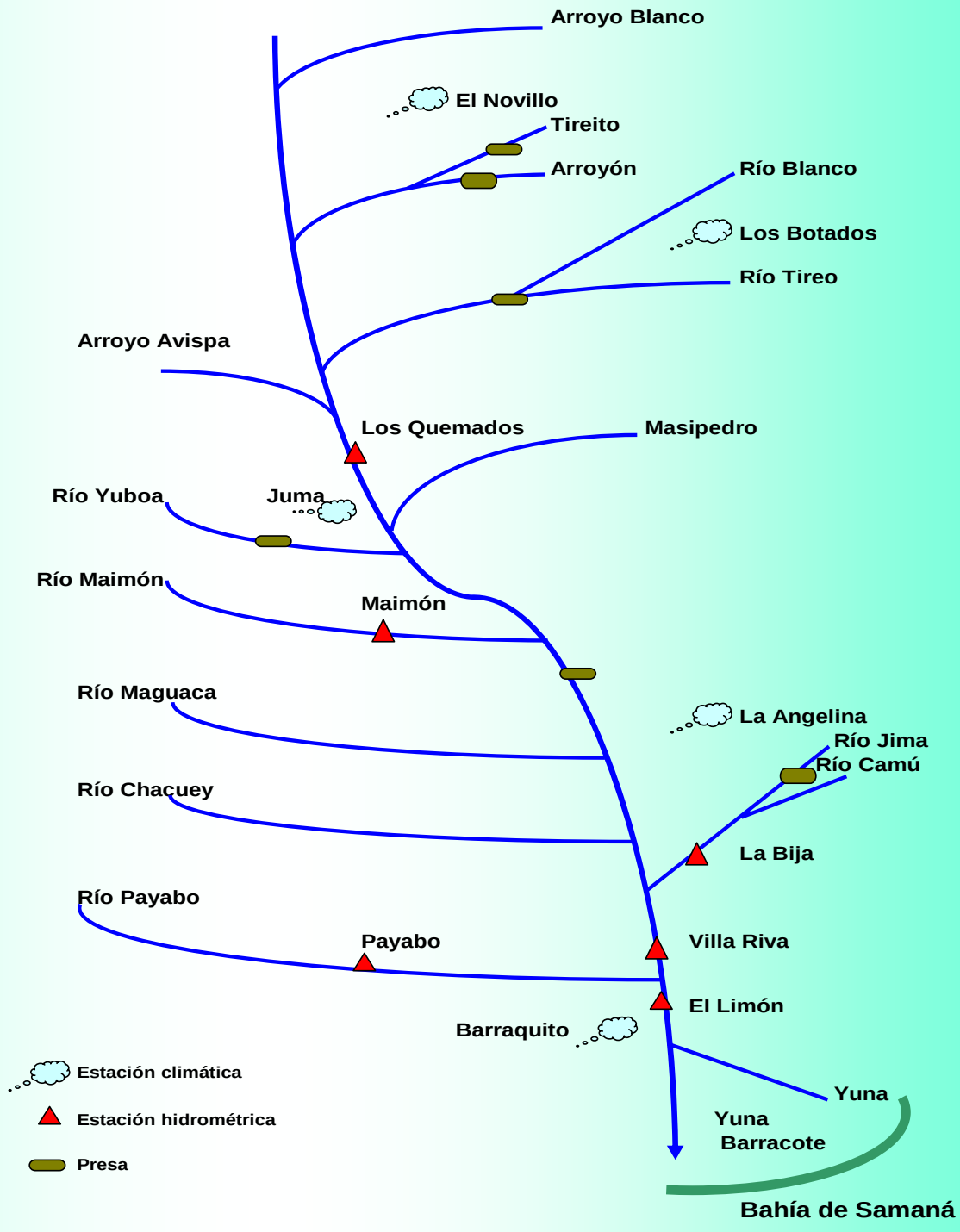
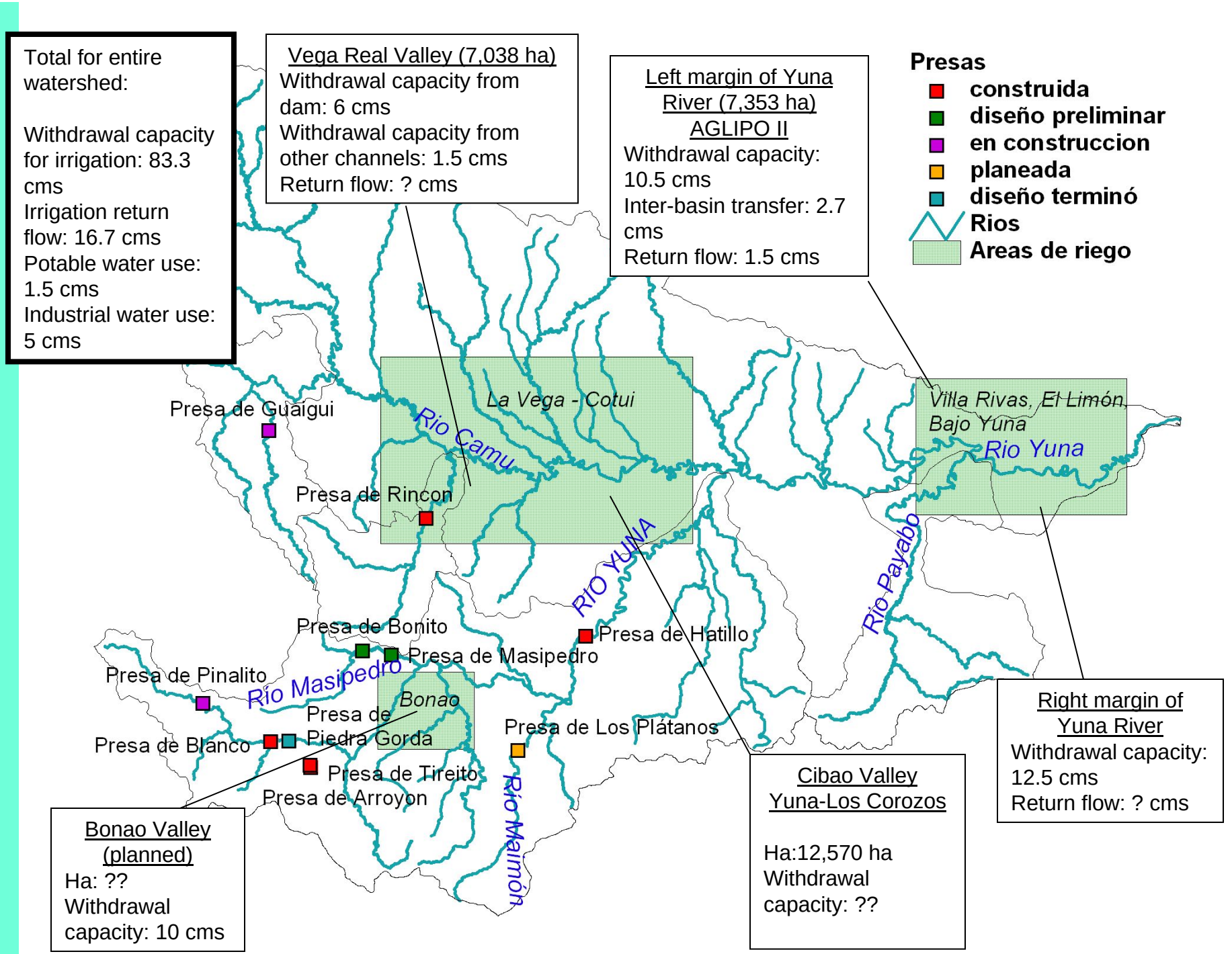
O E
S
Jose Contreras
Salcedo
Moca
Naranjal
Liceyen Naranjal
Naranjo Dulce
Cenovi en Santa Ana
San Francisco
Camú Bayacanes
La Vega
Ranchito
Jarabacoa
Angelina
Barraquito
Cotui
Payabo en Abadesa
Cevicos
Maguaca en Maguaca
Chacuey los Tres Pasos
La Ceyba
Yuna Los Quemados
Juma Bonao
Maimón
Los Botados
Piedra Blanca
El Novillo
Río Cana
Río Moca
Río Verde
Río Camú
Río Jayaco
Río Jagüey
Río Jima
Río Grande
Río Cuaro
Río Jaya
Río La Guira
Río Cunia
Río Jagüil
Río Nigua
Río Yaiba
Río Yanaho
Río Yuna
Río Chacuey
Río Maguaca
Río Tireo
Río Blanco
Río Yubaz
Río Maimón
Río La Lemona
Río Ara
Río Yá
Río Payabo
Simbología
Climática
Hidrométrica
Pluviométrica
Pueblos Principales
Ríos
Carreteras Principales
Límite de Cuencas

YUNA RIVER AND ITS AFLUENTS

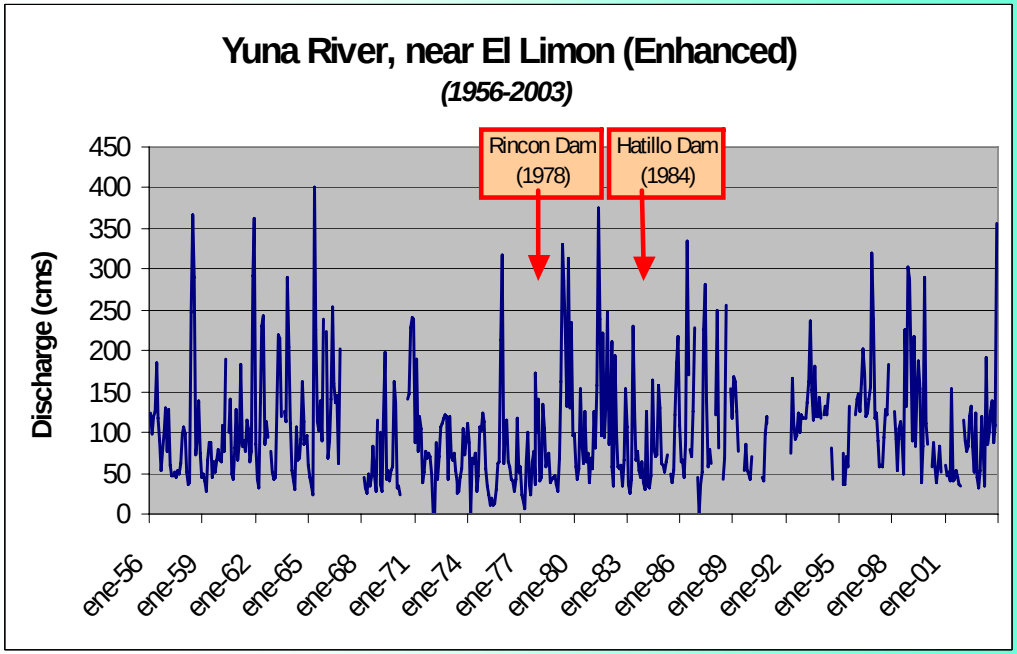


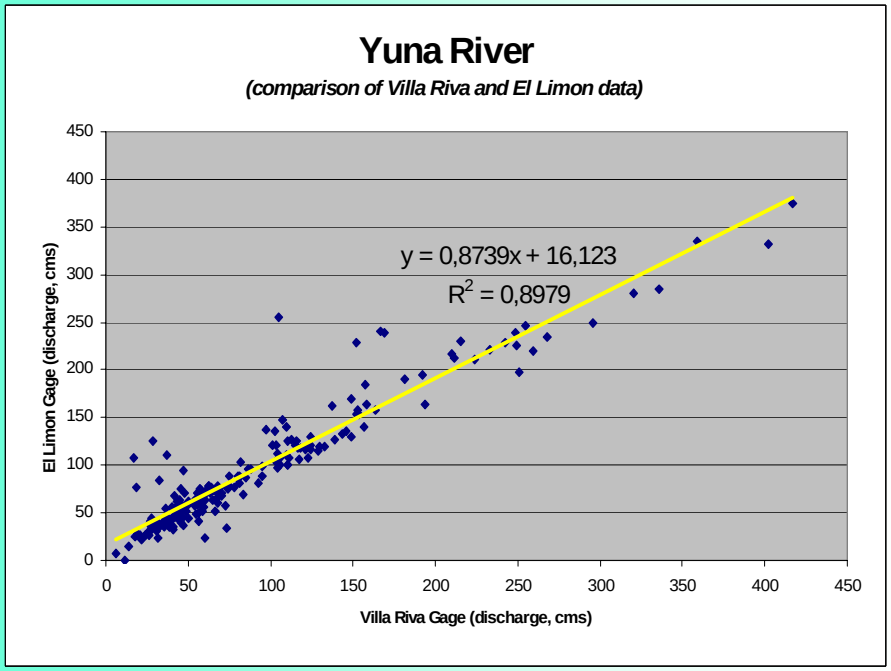

Total for entire watershed:
Withdrawal capacity for irrigation: 83.3 cms
Irrigation return flow: 16.7 cms
Potable water use: 1.5 cms
Industrial water use: 5 cms
Vega Real Valley (7,038 ha)
Withdrawal capacity from dam: 6 cms
Withdrawal capacity from other channels: 1.5 cms
Return flow: ? cms
Left margin of Yuna River (7,353 ha)
AGLIPO II
Withdrawal capacity: 10.5 cms
Inter-basin transfer: 2.7 cms
Return flow: 1.5 cms
Presas
construida
diseño preliminar
en construccion
planeada
diseño terminó
Rios
Areas de riego
Presa de Guaigui
La Vega - Cotui
Rio Camu
Presa de Rincon
Villa Rivas, El Limón, Bajo Yuna
Rio Yuna
RIO YUNA
Río Payabo
Presa de Bonito
Presa de Masipedro
Presa de Hatillo
Presa de Pinalito
Río Masipedro
Bonao
Presa de Piedra Gorda
Presa de Blanco
Presa de Tireito
Presa de Arroyon
Presa de Los Plátanos
Río Maimón
Right margin of Yuna River
Withdrawal capacity: 12.5 cms
Return flow: ? cms
Cibao Valley Yuna-Los Corozos
Ha:12,570 ha
Withdrawal capacity: ??
Bonao Valley (planned)
Ha: ??
Withdrawal capacity: 10 cms

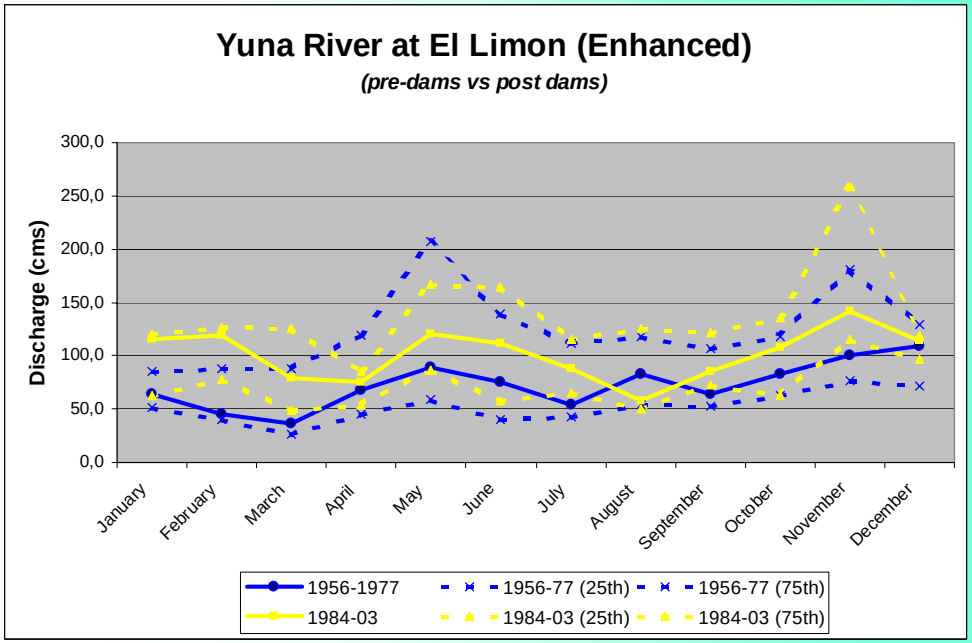
Yuna River
Hydrological Characterization

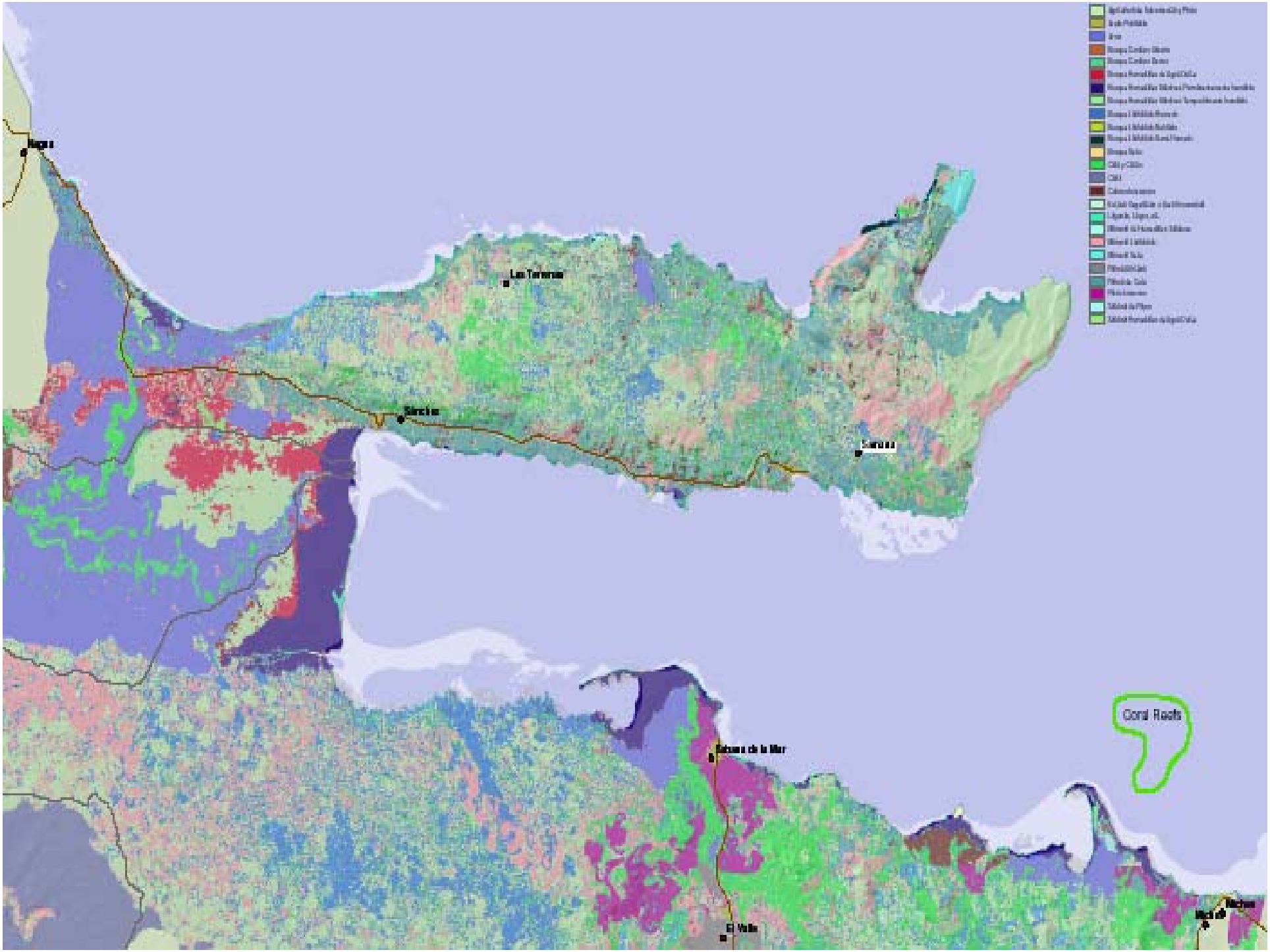
Due to the large quantity of precipitation in this basin, as well as the poor drainage, a large area in the lower Yuna periodically floods. Inflow to estuary is altered by dams requiring a sustainable water management

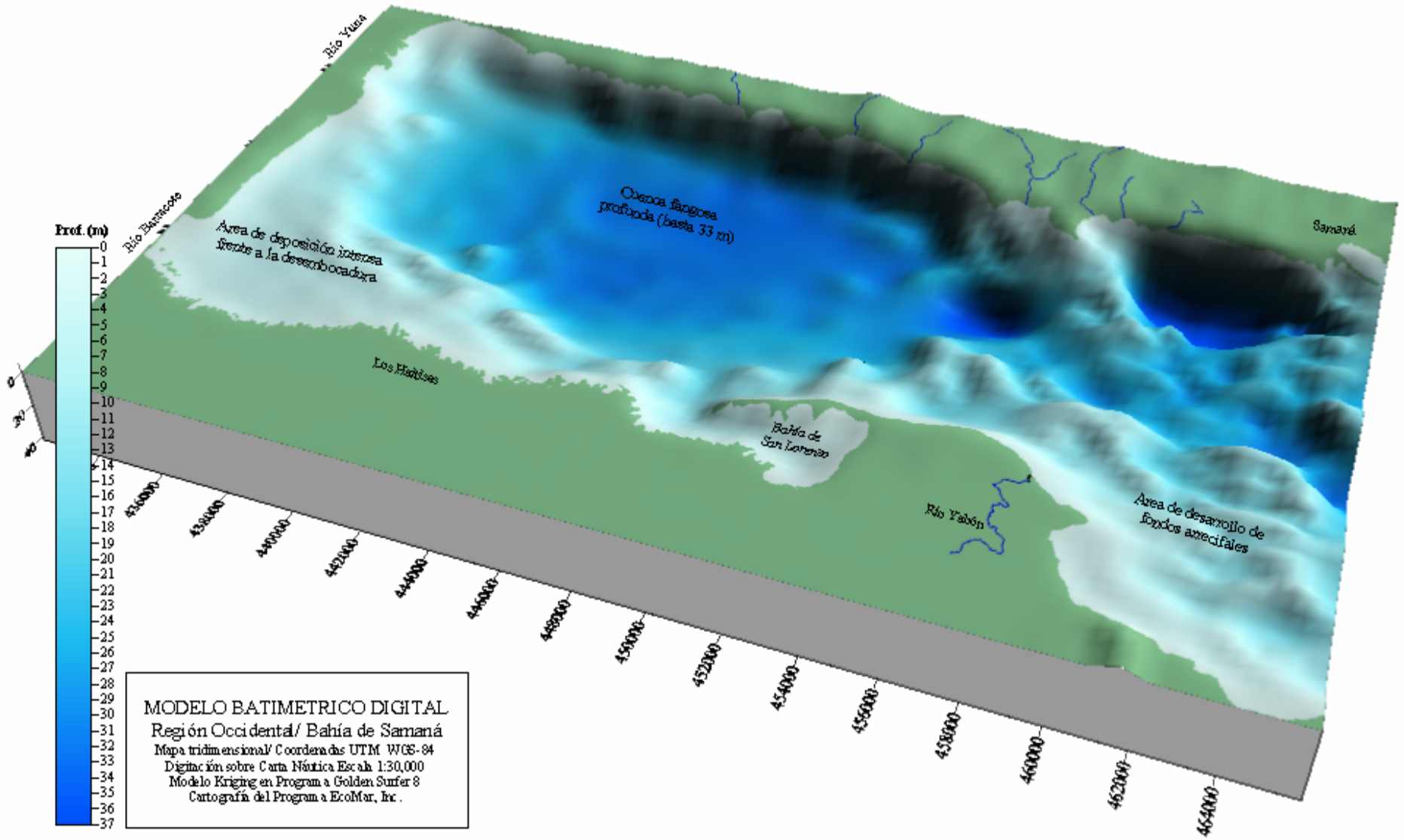
Station Name (number)	Quad Name	Period of Record
Yuna, near Los Quemados (180001)	Bonao	1962-1979
Yuna, near Villa Riva (180003)	Villa Riva	1956-1992
Yuna, near El Limon (180004)	Cevicos	1969-2003
Maimon River (184001)	Bonao	1968-2000
Camu River (185003)	Cotui	1968-2003
Payabo River (187002)	Cevicos	1971-1995








Coral Reefs


Río Yura
Río Barracote
Prof. (m)
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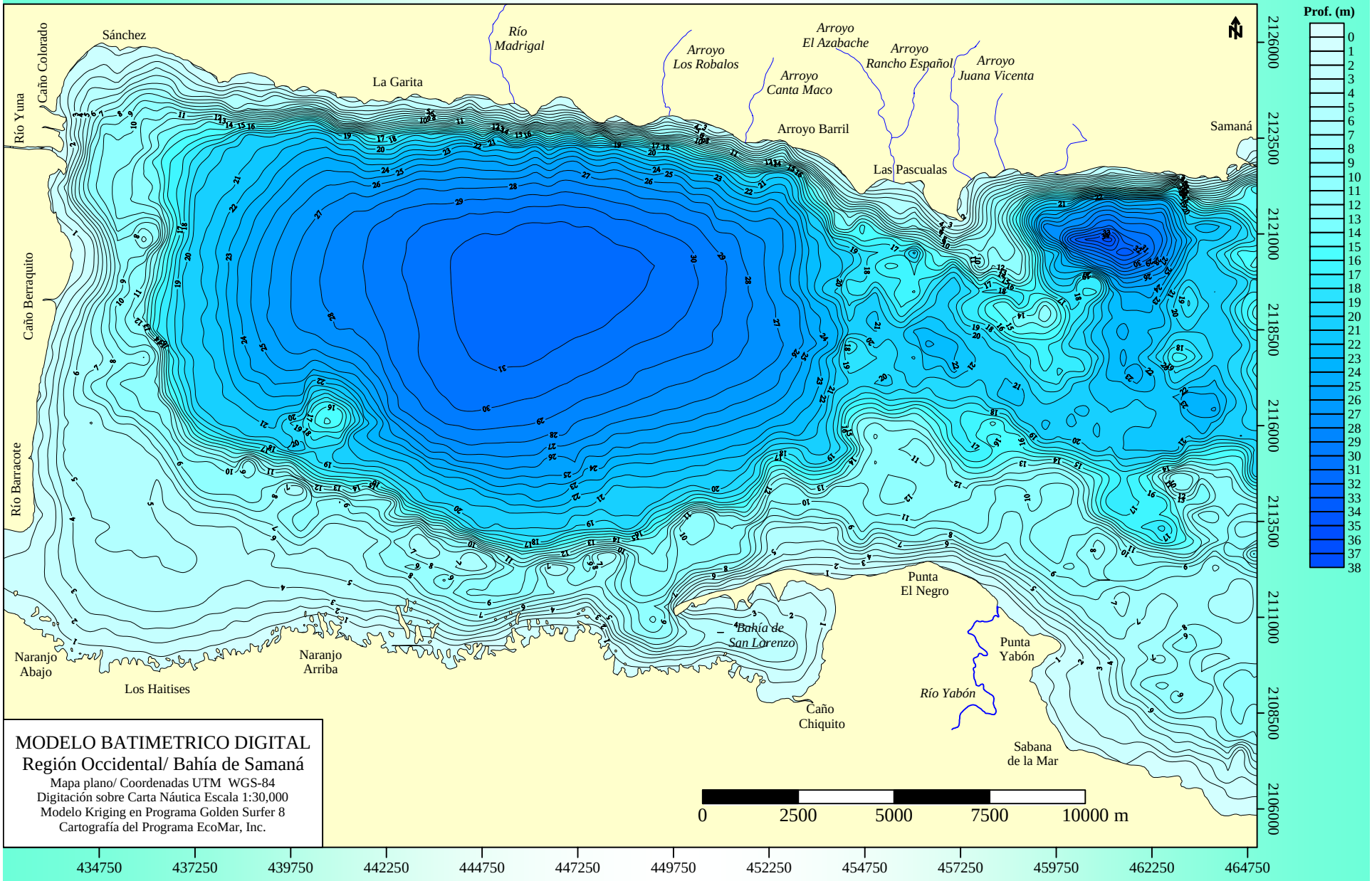
Area de deposición intensa frente a la desembocadura
Cuenca fangosa profunda (hasta 33 m)
Samaná
Los Haitises
Bahía de San Lorenzo
Río Yabón
Area de desarrollo de fondos arrecifales
MODELO BATIMETRICO DIGITAL
Región Occidental/ Bahía de Samaná
Mapa tridimensional/ Coordenadas UTM WGS-84
Digitación sobre Carta Náutica Escala 1:30,000
Modelo Kriging en Programa Golden Surfer 8
Cartografía del Programa EcoMar, Inc.


Prof. (m)
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Sánchez
Río Yuna
Caño Colorado
Río Madrigal
Arroyo Los Robalos
Arroyo El Azabache
Arroyo Canta Maco
Arroyo Rancho Español
Arroyo Juana Vicenta
La Garita
Arroyo Barril
Samaná
Las Pascualas
Caño Berraquito
Río Barracote
Punta El Negro
Punta Yabón
Bahía de San Lorenzo
Río Yabón
Naranjo Abajo
Naranjo Arriba
Los Haitises
Caño Chiquito
Sabana de la Mar
2126000
2123500
2121000
2118500
2116000
2113500
2111000
2108500
2106000
434750
437250
439750
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444750
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459750
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464750
0
2500
5000
7500
10000 m
MODELO BATIMETRICO DIGITAL
Región Occidental/ Bahía de Samaná
Mapa plano/ Coordenadas UTM WGS-84
Digitación sobre Carta Náutica Escala 1:30,000
Modelo Kriging en Programa Golden Surfer 8
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ASSESSMENT WITH PARTICIPATION OF DOMINICAN GOVERNMENT AND NGOs

LOCAL WATERSHED AND ESTUARY COMMUNITIES IN JOINT MEETINGS

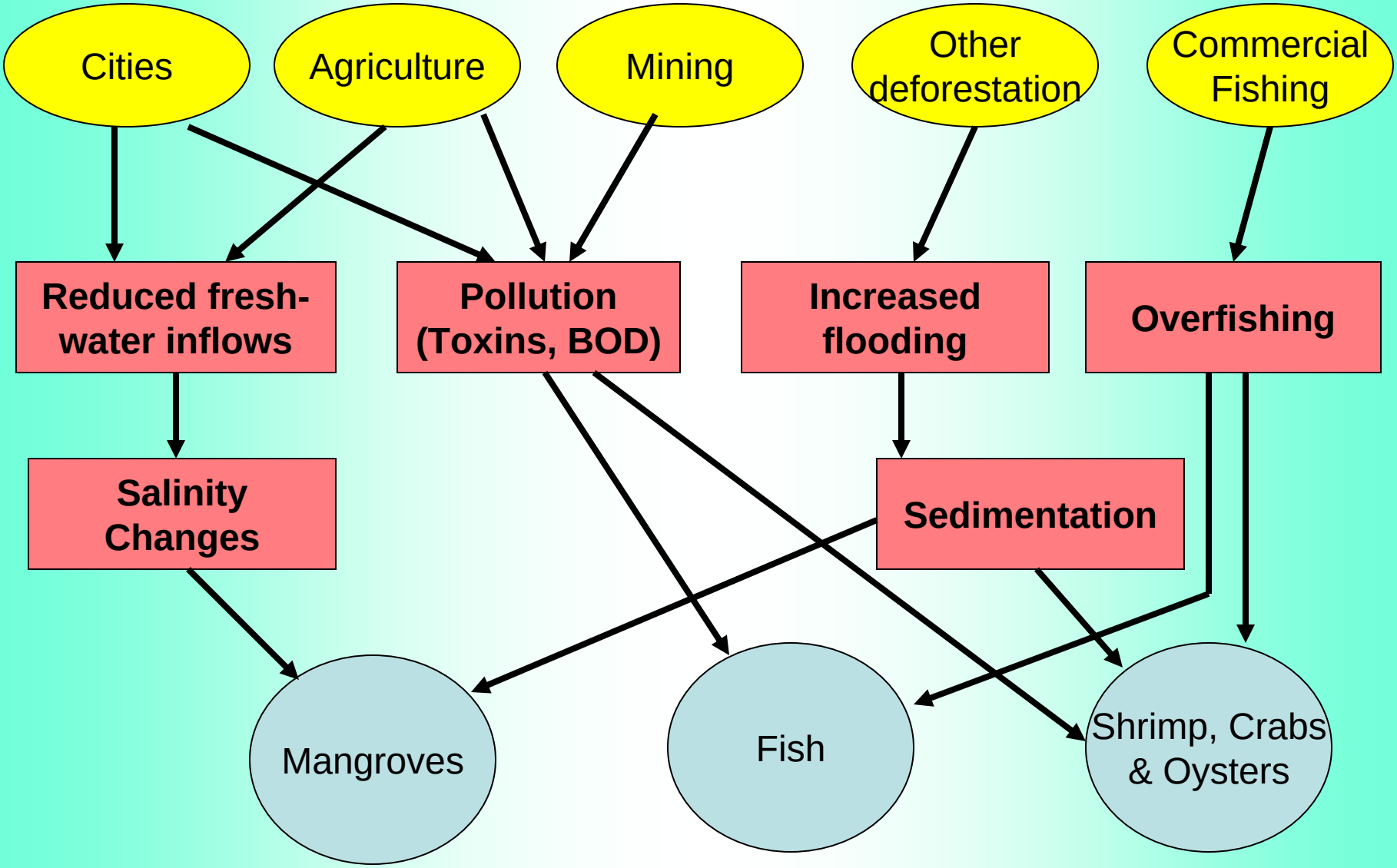
Human Activities: threats and sources

Sustainable Ecotourism and Fisheries Activities

Conclusions from stakeholders analysis

- The ecology of mangrove and other estuarine communities of the Yuna-Samana Bay estuary are dependent on freshwater flows.
- Alteration to the freshwater flows of the Yuna River and tributaries and associated salinity regime are responsible for mangrove swamp becoming more saline in the low flow period due to evaporation and saltwater intrusion.
- Changes in the estuary has probably had extensive effects on the mangrove and estuarine community, such as loss of mangrove integrity, increasing sedimentation, and decreasing commercial fish catches.

Threats to Samana Bay



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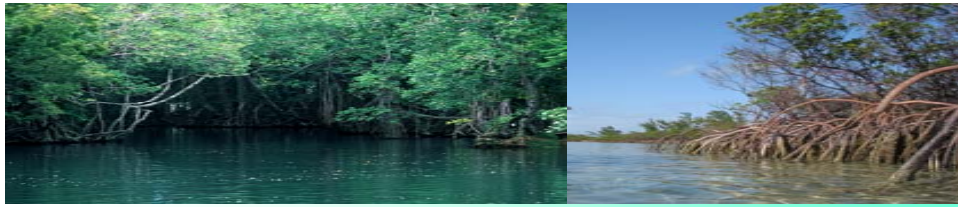

Muchas Gracias!